MINISTRY OF TRANSPORTATION

RoadTalk

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PLEASE CIRCULATE:

EDP/TT Initiative

Knowledge Transfer Through Talent Management

EDP participants Miao Zhou (front) and Olga Garces tour a job site at the Hogg's Hollow Bridge.

Timely and appropriate transfer and management of knowledge is an ongoing strategic goal for the Ministry of Transportation (MTO). With this in mind, two recruitment initiatives geared towards young professionals were created to prevent the loss of knowledge as engineers, technical staff and managers retire from MTO within the next 10 years. As mentioned in past Road Talk issues (see Road Talk August 2004, November 2004), the Engineering Development Program (EDP) and the Transportation Technician (TT) initiative have been attracting recent graduates to MTO since 2001.

The EDP and the TT initiative bring new staff into entry-level engineering and technical positions each spring to continue talent management. These two programs allow experienced MTO staff and managers to pass their knowledge onto younger employees, helping to ensure the ministry will continue to have skilled and competent workers. The EDP and TT initiative also address staffing challenges caused by demographics, mobility issues, and a limited supply of skilled and experienced staff. These challenges exist in both the public and private sectors.

The EDP has recruited 59 engineers-in-training since its inception in 2001, (including 14 new participants chosen for 2006) with an overall retention rate of over 90%. This program is a long-term solution for supplying engineers for several business-critical positions. During this four-year program, participants become eligible to obtain their licenses from the Professional Engineers of Ontario (PEO), and subsequently, have two-years to compete for permanent positions within the ministry. To date, 11 EDP participants have successfully competed for promotions within MTO.

The EDP is directed at recent civil engineering graduates, and consists of head office and regional assignments in various locations within the province. Typically, assignments

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Technology Transfer is a communication process by which information, regarding an improvement in a product or method, is exchanged and implementation into practice is facilitated.

Ontario

last six to twelve months. All EDP participants design a 4-year work plan that must incorporate a variety of assignments focusing on highway design, construction, geotechnical, traffic, structural, and operations.

As part of the EDP, participants are assigned a professional engineer from their home location who acts as their mentor throughout the program. Through mentoring, EDP participants learn the culture, history and business practices of the ministry. Gordon Troughton, Regional Contracts Engineer in Central Region and two-time EDP mentor, articulated the importance of mentoring: "You go to meetings where everyone acknowledges the importance of knowledge transfer, but no one can really agree on the how to go about doing it. For me, the best way to achieve knowledge transfer is through one-on-one interaction with programs like the EDP and the TT initiative."

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> -Gordon Troughton-
> EDP Mentor

The ministry has hired 121 TTs since the initiative began, (including the 14 candidates chosen for 2006) with an 80% retention rate. This three-year program of rotational assignments provides recent civil engineering technology graduates with practical, multidisciplinary experience. The assignments focus on a variety of areas, such as highway design, structural, operational services, construction and environmental. TTs receive day-to-day peer mentoring from experienced technicians and engineers to promote knowledge transfer during their rotations. After completing three years of rotational assignments, participants continue working as TTs until they are successful in competing for another MTO position. Fifty-four of the TTs have successfully competed for promotions within MTO.

EDP and TT initiative hiring practices are based on the availability of resources, the future requirements for engineers, managers and technical staff, and the quality of the applicants. Once hired into their programs, the EDP participants and TTs are assigned to two different divisions within the ministry and several geographical regions within the province. The programs' participants are allocated based on ministry business needs and the availability of high-quality learning and development opportunities. For 2006, EDP participants and TTs have been assigned to five regions and three branches representing both the Provincial Highways Management and the Policy, Planning & Standards divisions.

David Miguel works on the preliminary design of the QEW detour for the Burlington Skyway Expansion joint repair during his TT assignment at the Planning and Design Office.

In the next 10 years, the ministry faces the challenge of maintaining its status as the knowledgeable owner and custodian of Ontario's provincial highway network, despite the retirement of critical engineers, technical staff and managers. In preparation for this, MTO is currently exploring various methods of knowledge transfer. With programs like the EDP and TT initiative, the ministry is taking steps towards securing a future work force that is well trained and capable. Not only do the EDP and TT initiative participants help fill the gaps of retiring MTO employees, but they also bring fresh ideas to the field and an eagerness to learn as well.

For more information about the EDP and TT initiative visit: http://www.mto.gov.on.ca/english/engineering/job/index.html

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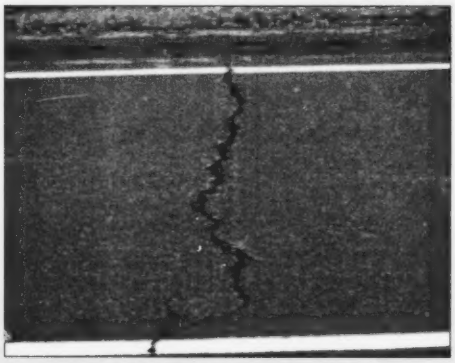
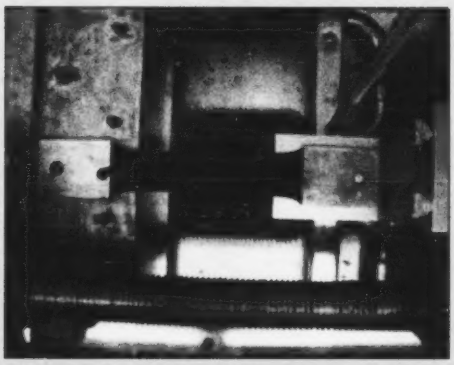
Asphalt Crack Prevention

All Eyes On The Road



Premature cracking lowers overall pavement performance.



New test methods (like the DENT test, shown above) are being developed to aid in selection of more crack resistant materials.

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Pavement cracking during cold temperatures is a major form of pavement deterioration affecting asphalt roads in Ontario. Queen's University recently presented a paper at the Transportation Research Board on a potential solution to this problem. This study was partially funded through the ministry's Highway Infrastructure Innovation Funding Program (HIIFP), which is a grants research program for Ontario universities. Dr. Simon Hesp (of Queen's University) has developed new tests to accurately predict the crack resistance of asphalt materials at low temperatures.

Pavements investigated in the study at Queen's University encountered different levels of premature cracking, even though the pavements all met the same Performance Graded Asphalt Cement (PGAC) guidelines and therefore, were expected to have similar performance. This led MTO to identify three deficiencies in the current asphalt specifications; two of which will be addressed in this article:

A) The cold temperature conditioning used in the tests is insufficient to simulate pavement exposed to Northern Ontario winters.

B) There is an absence of a fracture mechanics-based test to better identify cracking at extreme cold temperatures and at freeze-thaw temperatures.

These two shortcomings in the PGAC specifications are addressed in the new test protocols developed at Queen's University by the Extended Bending Beam Rheometer (BBR) test and the Double-Edge-Notched Tension (DENT) test. The Extended BBR test determines when asphalt will crack if exposed to low temperatures over an extended period of time. The DENT test evaluates the ability of asphalt cement to stretch at temperatures ranging from 0 to 20^{O} C.

Using both the Extended BBR and the DENT tests, lab testing and field monitoring were completed for three sites in Ontario that experienced extensive cracking during their first winter. Two of the roads monitored did not involve paving over an existing cracked road, while the third site did. Therefore, the premature cracking at two of the sites could not be attributed to reflective cracking.

The results of the Extended BBR test from the test sites predicted cracking at higher temperatures than what the current testing protocol expected. Overall, the study proved the Extended BBR test was able to accurately predict which asphalt binders would perform successfully when exposed to low temperatures. Furthermore, the data from the test sites confirmed that the longer a pavement is exposed to these conditions, the more susceptible some asphalt cements can be to cracking due to the degradation in resistance to low temperature cracking properties. These tests will aid in choosing the correct materials for hot mix asphalt paving to produce an economical design, prevent asphalt cracking and thus, lead to more durable pavements.

Based on the findings to date, additional trials will be constructed and evaluated to assist MTO in developing policies for selecting better performing asphalt materials. Major trials are planned to be constructed on Highway 417 in Eastern Region, and on Highway 655 in Northeastern Region, as Phase II to an earlier trial (To read more about Phase I see Road Talk August 2004).

Currently, MTO is working with samples from several construction contracts constructed last year to see how they are characterized by the newly developed tests. This step in creating specifications for future test requirements will also provide insight into crack prevention on materials used in other areas of the province.

MTO recently invited asphalt suppliers' labs to participate in an Extended BBR correlation program to determine the test's variability and repeatability. The correlation program provided suppliers a chance to familiarize themselves with the newly published test procedure (LS-308). Also, DENT testing continues within MTO's laboratory, with the goal of refining the procedure from its current published draft format (LS-299). Look for both test procedures as part of the latest revision to the Laboratory Testing Manual. •

MTO Answers the "Repair Our Air" – Fleet Challenge

Success!

MTO recently took the "Repair Our Air"- Fleet Challenge, and succeeded! The "Repair Our Air" – Fleet Challenge is an annual program funded by Natural Resources Canada to contribute to the reduction of greenhouse gas emissions through the promotion of effective fuel management practices.

Each year private and public-sector organizations with large fleets of vehicles take the "Repair Our Air" – Fleet Challenge to reduce fuel consumption by up to 20% through the adoption of best practices of reduced idling. Research shows that many vehicle fleets idle 20-60% of their operating time, while the most efficient sustained an idling average of 5-10%.

Idling is harmful to the environment because it contributes to the release of excessive amounts of carbon dioxide into the air – which is one of the main Greenhouse Gas emissions (GHG) adding to the enhanced Greenhouse Effect. The "Repair Our Air"- Fleet Challenge promotes reduced idling as the first step towards improved fuel efficiency and the creation of a comprehensive Green Fleet plan.

With the overall goal of implementing effective fuel management practices in mind, the ministry entered eight vehicles in the challenge from around the province (Southwest, Northeast, Eastern and Central regions). Each of the participating vehicles was equipped with Global Positioning System (GPS) based measurement technology provided by Grey Island Systems. The measurement technology identifies when the vehicle is idling for longer than 2 minutes, after which it starts to record the amount of idle time. This record is called a "Stop Report" and was the main standard used in calculating the vehicles' idling averages for the challenge.

Prior to the challenge, the ministry vehicles entered in the competition maintained a promising idling average of 16-20%. However, over the four-month long challenge, MTO staff succeeded at reducing the idling average to an impressive 4% and maintained that average throughout the program, despite winter temperatures. MTO Fleet Co-ordinator Torben Frederiksen accepted an award from Natural Resources Canada on behalf of MTO and the regional participants. Furthermore, Central Region MTO Fleet Challenge leaders Grant Horton and Albert Passmore (with the support of Mike Levigne, Head of Fleet Services in Central Region) maintained an amazing idling average of less than 1% throughout the entire challenge. Malcolm MacLean, Director of the Construction and Operations Branch presented both Horton and Passmore with certificates of excellence and sincere congratulations for their outstanding accomplishments.

Special thanks to all of the regional participants for their contributions to MTO's success in meeting this challenge. •

For more information, contact Torben Frederiksen, Maintenance Office, at (905) 704-2961 or Torben.Frederiksen@mto.gov.on.ca

Director Malcolm MacLean congratulates (from left to right) Albert Passmore, Grant Horton, Torben Frederiksen and Mike Levigne for their hard work in the challenge.

Did You Know?

MTO supports new vehicle technology and alternate fuel vehicles such as natural gas and ethanol-fueled vehicles and hybrid vehicles.

For more information about this article visit these helpful sites:

Greenhouse Effect and Climate Change
http://www.climatechange.gc.ca/english/climate_change/

Impacts of idling visit:
http://www.oee.nrcan.gc.ca/transportation/personal/idling.cfm?attr=16

Flexible Spring Load Seasons

Using Road Weather Information Systems

The ministry endeavours to maintain a balance between protecting its road system and mitigating impacts to industry. For this reason, load restrictions are only put in place when conditions make it absolutely necessary. To protect road surfaces and foundations, load restrictions are placed on surface-treated highways in northern Ontario. These restrictions are imposed during the spring thaw when the highway surface or foundation is susceptible to road damage by fully loaded trucks, such as fatigue cracking.

The process of determining when restrictions are needed, and for what duration, takes place every year and considers actual field conditions. Better prediction models of when the road foundations is frozen or thawed assists road authorities in ensuring spring load restrictions are appropriately applied.

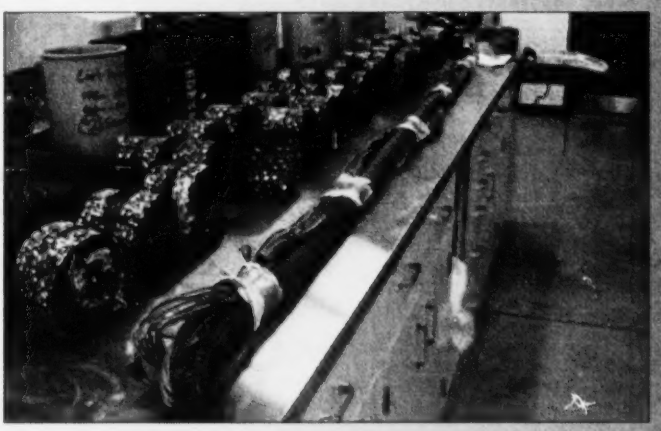
With support from MTO's Highway Infrastructure Innovations Funding Program (HIIFP), Dr. Susan Tighe at the University of Waterloo is working with the ministry's Maintenance Office, and Northwest and Northeast Regions, to develop such a forecasting system. Phase I of the project began during the summer of 2005. An array of thermistor sensors (a type of electronic thermometer) was installed up to 2.5 metres under the road surface to monitor the progression of freezing and thawing conditions over the winter. This information will be combined with Road Weather Information System (RWIS) data, collected for use by the ministry's winter maintenance program, to develop mathematical models allowing short-term prediction of freezing and thawing conditions.

Other phases of the study will examine the relationship between the freeze-thaw model and the road surface load carrying ability. Also expected is the interpolation of RWIS data from the existing network to load restricted highways that do not have RWIS stations present. Finally, a plan will be developed to integrate the prediction models with the RWIS system so that road managers throughout the province will have easy access to this innovative prediction tool. If this tool proves valuable, it will provide MTO with additional technical data to assist in determining when to implement the load surplus and restriction periods for roads in northern Ontario.

A. A typical vehicle travelling on highways in northern Ontario, carrying a heavy load.

B. The arrangement and installation of a thermistor sensor in the road surface.

C. An uninstalled thermistor string before it is placed in the testing field (pictured in the John J. Carrick Pavement Laboratory at the University of Waterloo's Centre for Pavement and Transportation Technology).



For more information, contact Max Perchanok, Maintenance Office, at (416) 235-4680, or Max.Perchanok@mto.gov.on.ca
or
Dr. Susan Tighe, Department of Civil Engineering, University of Waterloo, at (519) 888-4567 ext. 3152, or sltighe@uwaterloo.ca

Upcoming Conference Information

July 30 – August 3
International Symposium on Transportation Technology Transfer
St. Petersburg, Florida

August 2 – 3
International Conference on Funding Transportation Infrastructure
Banff, Alberta

August 6 – 9
International Conference on Fatigue and Fracture in the Infrastructure Bridges and Structures of the 21st Century
Philadelphia, Pennsylvania

August 12 – 17
International Conference on Asphalt Pavements
Quebec City, Quebec

August 23 – 25
International Conference on Short and Medium Span Bridges
Montreal, Quebec

September 10 – 14
International Level Crossing Safety and Trespass Prevention Symposium
Montreal, Quebec

Reader Response

Got a great article idea for Road Talk?

Send us any ideas, comments, or suggestions concerning local innovations, workshops, or seminars that you would like to see included in future issues.

Road Talk is also available in French.

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MTO Selects InRoads™ As Its New Highway Design Software

Out With The Old, In With The New

In March 2006, the Ministry of Transportation (MTO) selected InRoads™ as its new highway design software. InRoads™, which operates in an AutoCAD™ environment, will replace MTO's current DOS-based, highway design system (HDS). InRoads™ software (from Bentley Systems Inc) is Windows™-based and integrates well with the MTO current operating environment. Moreover, InRoads™ is expected to produce more accurate quantity calculations and cost savings in MTO design assignments.

InRoads™ creates 3-D digital surfaces, horizontal and vertical alignments and cut profiles. In addition, the software defines template criteria, generates cross-sections and 3-D models and calculates volumes. InRoads™ also generates customized reports, design evaluations, and can create final plan and profile sheets. Furthermore, InRoads™ will provide fast and cost-effective new construction opportunities through the use of Global Positioning System (GPS), and grade control systems.

Bentley Systems' experience and leadership position in transportation were both key factors for implementing InRoads™ as the replacement for HDS. Bentley Systems' solutions for transportation engineering are used by 48 North American transportation agencies such as Transports Québec; the Nova Scotia Department of Transportation and Public Works; the New Brunswick Department of Transportation; and the Prince Edward Island Department of Transportation and Public Works. Bentley InRoads™ is also used by 20 other transportation agencies in the United States.

The four-year contract with Bentley Systems includes software acquisition that will be used in a Distributed Network License Servers Model, implementation and customization services, and training. Through Bentley's Enterprise Training Subscription (ETS) program, MTO will be able to maximize its training investment for its head office and five regional offices. MTO has announced its implementation plan and is offering upcoming seminar opportunities to introduce Bentley Systems and to provide an overview of InRoads™ for MTO staff and consultants. Implementation is expected to be completed by October 2006, with HDS being phased out starting January 2007 and decommissioned by January 2008. ●

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Bentley InRoads Information Session

MTO readers interested in learning more about Bentley Systems and InRoads can attend a one-day information session at their regional office. Click here to reserve your seat at a session.